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ABSTRACT

First in a series designed to provide teachers and administrators with a reference tool for identifying, evaluating, and selecting software for use in computer-based teaching and learning, this guide describes those resources available through the New York State Education Department and regional services throughout New York. The activities and services of the Center for Learning Technologies (CLT) are highlighted, followed by a description of Demonstration and Technical Assistance Centers and of the CLT's efforts to improve the quality of commercially available hardware. A report on activities conducted to plan and test a statewide telecommunications network emphasizes how the proposed network would facilitate the exchange of information in educational software and technology applications. Two other support resources are discussed, the Media Distribution Network and Computer Training Labs, which provide materials and professional development resources designed to help practitioners bring technology into the classroom. A general purpose glossary and a 38-item bibliography are included. Appendices provide a list of software publishers participating in CLT software initiatives and software publishers who attended a 1982 New York State Department of Education conference. (LMM)

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GUIDE TO SOFTWARE SELECTION RESOURCES:

PART ONE

EDUCATIONAL TECHNOLOGY RESOURCES IN NEW YORK STATE

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Parts I and III of this **Guide** were written by Charles Mojkowski of Educational Consulting Services, Cranston, RI. Part II was prepared by Nancy Baker Jones of the Southwest Educational Development Laboratory and Larry Vaughan of the Northeast Regional Exchange, Inc.

Robert Caldwell, chairman of the National Council of Teachers of English Committee on Instructional Technology, provided resource information used in Part III.

Foreword

As with all instructional material, the selection of appropriate educational computer software is one of the most important responsibilities of teachers and administrators. In these early stages of the development of educational applications of the microcomputer and other interactive learning technologies, it is important to establish a strong foundation for our uses of these powerful new tools. Unfortunately, it has become commonplace to hear criticism of much of the available microcomputer educational software. Unless high quality materials are used appropriately, the power of the technology will be wasted.

Recognizing the critical role of software in computer-based teaching and learning, the Center for Learning Technologies of the New York State Education Department and the Northeast Regional Exchange are pleased to provide this resource series for teachers and administrators. It provides information on resources and tools for locating software and assessing its appropriateness for various instructional applications. The purpose of the series is not to identify "good" software for educators, but to provide a means through which teachers can make decisions about appropriateness and quality within the context of their curriculum and instructional needs.

This **Guide to Software Selection Resources** has been designed as a resource series to aid the decision making process in schools. The series includes both generic and content area resources. Part III is the first of the content-specific materials; it focuses on reading and communication skills. Continued collaboration between the Center for Learning Technologies and the Northeast Regional Exchange will yield additions to this **Guide** that focus on mathematics, science, and other curriculum priorities.

Gregory Benson
Director
Center for Learning Technologies
New York State Education Department

J. Lynn Griesemer
Executive Director
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Chelmsford, Massachusetts

Overview

The purpose of this **Guide to Software Selection Resources** is to provide teachers and administrators with a reference tool for identifying, evaluating and selecting software for use in computer-based teaching and learning. The **Guide** is organized as a series of modules that deal with different aspects of the process.

Part I provides an overview of software selection and general educational technology resources in New York State. This section serves as a preamble to the remaining sections of the **Guide**, which deal with software selection resources in specific content areas. Special emphasis is placed on the organizational and material resources that are available throughout New York State to assist educators in implementing meaningful applications of computer technology, particularly software.

Part II is a general purpose introduction to evaluating software. Prepared by the Northeast Regional Exchange, Inc. and the Regional Exchange of the Southwest Educational Development Laboratory, **Evaluation of Educational Software: A Guide to Guides** serves as a introduction to criteria, procedures and sources of software evaluation information.

Part III deals with software selection information and procedures relating to reading and communication skills. Subsequent updates of the **Guide** will deal with additional subject areas, as well as new general purpose resources. A section on mathematics and science software is presently under development and will be available as Section IV of this **Guide** in late winter, 1984.

A number of assumptions explain the approach we take in the **Guide**:

- Software evaluation and selection is only one component of a comprehensive computer program development and implementation process. This process requires the identification and use of a wide range of information and assistance resources available throughout New York State.
- The selection and evaluation of software is primarily an educational task and only secondly a technical one. However powerful and sophisticated the microcomputer may be, the pedagogical quality of the software is what determines its value in supporting teaching and learning. Thus, while evaluation of software may be a relatively new activity, the evaluation of traditional instructional materials has been taking place for many years. Such evaluation forms the foundation for selecting software.
- Evaluating instructional materials requires an understanding of the teaching and learning context in which the materials will be used. What is "good" instructional material in one setting may be unacceptable in another. For this reason, we have avoided evaluating or recommending specific software. This is not to say that software evaluation is solely a matter of individual judgment; there are accepted standards and procedures that can be applied. This **Guide** deals with such standards, and explains how they can be used by teachers and administrators.

- The amount of software is growing rapidly, as are sources of information about it. This manual presents a "snapshot" of information available presently. Updates will be prepared as time and resources permit, helping teachers and administrators to keep up with new developments.

The loose-leaf format of the **Guide** allows you to add your own resources, as well as incorporate the updates provided by the Center for Learning Technologies. The Center would appreciate receiving copies of materials you identify so that they may be included in future editions. Please send them to:

Center for Learning Technologies
New York State Education Department
Cultural Education Center
Empire State Plaza
Albany, NY 12230

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INTRODUCTION

New York State has a wealth of resources for educators implementing technology applications in schools. This **Guide** describes those resources available through the State Education Department and regional service agencies throughout the State. Special emphasis is given to those organizational and material resources useful for identifying, evaluating and using educational software. This general introduction serves all of the remaining sections (both existing and future) of the **Guide**.

To coordinate the many initiatives of the State Education Department, the Center for Learning Technologies (CLT) was created in 1982. The Center's many activities and services are described on the following pages. A few of the Center's efforts are highlighted in subsequent sections. The Demonstration and Technical Assistance Centers are described; these centers are one of the principal means of extending technology resources directly to local school districts.

Next, CLT's efforts to improve the quality of commercially available software are described. The Software Colloquium serves as a major vehicle for organizing communication among educators and software publishers, and for promoting comprehensive and sound approaches to software evaluation and selection.

An important element in the effort to support local program development is a statewide communications and exchange system. Activities conducted to plan and test a statewide telecommunications network are reported. Particular attention is given to how the proposed network would facilitate the exchange of information on educational software and technology applications.

There are two other support resources aimed in part at helping educators improve their technological knowledge and skills. The Media Distribution Network and the Computer Training Labs provide New York State educators with material and professional development resources that help practitioners bring the technology into the classrooms.

A general purpose glossary and a bibliography serve as resources for subsequent sections of the manual.

THE CENTER FOR LEARNING TECHNOLOGIES

The Center for Learning Technologies (CLT) administers and coordinates activities of the New York State Education Department related to the use of appropriate technologies. CLT has evolved from the State Education Department's historical commitment and leadership in advancing technology in support of education. Founded on this commitment and experience, CLT continues to support the established technologies while developing approaches for new ones.

The Regents Advisory Council on Learning Technologies – composed of education, public television and computer industry personnel – provides the Education Department with a spectrum of expertise in planning CLT activities. Furthermore, CLT draws upon the vast human and material resources of the Education Department.

CLT has brought together instructional technology educators in a viable structure for maximizing the potential of technology on a statewide basis. Specific areas of expertise of professional staff include interactive technology, television production, engineering systems design, networking, public broadcasting, computer-assisted instruction and telecommunications. Nealy 3,000 additional Education Department staff form an available resource pool for consultation and assistance. Most CLT activities are cooperative ventures with other Department units.

CLT is housed in the Cultural Education Center located at the Empire State Plaza in Albany. Special resources of CLT include computer training labs and the CLT Media Distribution Network for duplication and distribution of computer, video and audio programs. Resources frequently used by the Center include the New York Network for television production; the editorial, production and graphic units of the Publications Bureau; the Educational Programs and Studies Information Service (EPSIS) system for research information retrieval; and the Basic Educational Data System (BEDS) for acquisition of information on schools.

SERVICES

A primary objective of CLT is to provide services to constituents. For information on eligibility and procedures for services listed, contact CLT or the Regional Center in your area.

Technical Assistance

Technical assistance services are available at CLT and the Regional Centers. Services include general consultation on program and system design, equipment maintenance, information exchange, demonstrations of model programs, and inservice programs for teachers and administrators.

Software & Hardware Acquisition

CLT assists in negotiating group purchase arrangements for both video and computer software; advises constituents on statewide contracts for video and computer hardware at considerable savings; and, through the CLT Media Distribution Network, provides constituents with video and com-

puter software. Catalogues of software and information on participation are available from the Network.

Media Productions

CLT produces media programming, especially radio and television, on an ongoing basis for both State and national distribution. Programming includes instructional series, public service announcements, teleconferences, video workshops, and informational programs for closed-circuit presentations to the field.

Publications

Publications from CLT include a quarterly newsletter, flyers and guides to supplement television productions, catalogues on available software and booklets on current topics in the area of instructional technology. Recent publications include "Computer Literacy: An Introduction" and "Getting Started: Planning and Implementing Computer Instruction in Schools."

Networking

New York State Network for Educational Telecommunications (NYSNET) is a computer-assisted communication delivery system being developed to facilitate information exchange among educators and provide access to available data bases. NYSNET will permit software exchanges, electronic mail, online newsletters, and electronic inventories of instructional materials and programs.

Public Television

As representative for the Office of Cultural Education, CLT acts as liaison between the Education Department and the nine New York State public television and twelve public radio stations. State grants to the stations are processed through CLT. Cooperative ventures include State and national teleconferences, television productions, cooperative program acquisition and instructional television services.

Research

Research conducted by CLT includes State surveys of hardware and software use, production of interactive technology programs (computer/videodisc) and support of school-based research. CLT submits proposals to government and private sources to support research efforts.

Business-Industry Liaison

CLT acts as a liaison between the business and educational communities to foster the joint development of technologies and mutual exchange of information to further economic development.

Grants

CLT administers local assistance including grants for instructional improvement and the use of technology to Regional Centers, Boards of Cooperative Educational Services (BOCES), and individual school districts.

REGIONAL DEMONSTRATION AND TECHNICAL ASSISTANCE CENTERS

The State Education Department has established six Regional Demonstration and Technical Assistance Centers (TAC) in strategic locations in the State. The Centers were established as an "outreach" mechanism that can be used by the Department's Center for Learning Technologies to encourage the use of microcomputers and other interactive technologies in the educational programs of local educational agencies. Each TAC serves a large geographic area which includes several BOCES regions; public and private educational agencies at all levels of education may be included in some or all of their activities.

The work plan for all Technical Assistance Centers relates to six major objectives established by the Center:

1. dissemination of information and research on current and future uses of computers and other interactive technologies in education;
2. promotion of the use of new technologies in learning through preservice and inservice workshops for teachers and administrators;
3. development of an efficient, reliable mechanism for evaluating computer software/courseware and hardware;
4. identification of appropriate processes and methodologies to be used for infusing learning technologies into curriculum areas;
5. provision of guidelines and materials for computer literacy programs; and
6. development of direct linkages between Center activities and the State's local education activities.

The six regional centers are:

- Broome-Delaware-Tioga Demonstration and Technical Assistance Center (Broome-Delaware-Tioga; Delaware-Chenango-Madison-Otsego; Greene; #2-Delaware-Schoharie-Otsego; Steuben-Allegany BOCES). Phone (607) 729-9301
- Herkimer Demonstration and Technical Assistance Center (Herkimer-Fulton-Hamilton-Otsego; Oneida-Madison-Herkimer; Madison-Oneida; Jefferson-Lewis-Hamilton-Herkimer-Oneida BOCES). Phone: (315) 363-8000 Ext. 282
- Monroe #2-Orleans Demonstration and Technical Assistance Center (Monroe #2-Orleans BOCES). Phone: (716) 352-2420
- New York City Board of Education/Queens College Demonstration and Technical Assistance Center (New York City area). Phone: (212) 596-4434
- Rockland Demonstration and Technical Assistance Center (Rockland; Westchester #2; Putnam-Westchester, Orange-Ulster; Dutchess BOCES). Phone: (914) 245-3261
- Suffolk II Demonstration and Technical Assistance Center (Suffolk #1: Suffolk #2; Suffolk #3; Nassau BOCES). Phone: (516) 289-2200 Ext. 230

SOFTWARE INITIATIVES

Numerous requests from educators throughout New York State for higher quality computer instructional software prompted the development of a new and innovative dialogue between educators and software publishers. In mid-December 1982, the State Education Department invited major software publishers to participate in a discussion of the feasibility of developing a collaborative relationship and to identify software criteria that would result in a closer match between commercial instructional materials and New York's educational objectives across all subject matter areas.

In response to the high level of interest, the Center for Learning Technologies of the State Education Department brought educators and publishers together as a Software Colloquium Planning Committee. This committee of publishers, State Education Department representatives, Project Directors of the Technical Assistance Centers, and school district representatives met in March, 1983 and developed a plan and materials for defining and evaluating software by subject matter and instructional design strategies. At this planning meeting, the members developed an evaluation form satisfactory to both educators and publishers. This form and a jointly developed "Courseware Description Grid" were used during the spring to evaluate software provided for review purposes by the publishers without charge.

National Computer Systems (NCS) redesigned, at their expense, the instrument into a format that is capable of being scanned optically by a computer (see the form on the following pages). Software reviewers located in the service areas of the Center's Regional Demonstration and Technical Assistance Centers reviewed the software during May and June, 1983 and returned the data to the Center for Learning Technologies. The Center published the results for analysis at a July 15 Software Colloquium. At this meeting publishers, reviewers, software authors and State educators identified criteria for improving future software development and intensively analyzed the evaluation results. The following publishers and distributors provided software for the evaluation process: The Cambridge Development Lab; Edu Tech; Encyclopedia Britannica Education Corporation; Harcourt, Brace, Jovanovich; Houghton Mifflin Company, Random House; Scholastic Incorporated; Science Research Associates; and Honeywell. (A list of software publishers participating in CLT software initiatives is provided in the Appendix to this section.) Several of the producers submitted prototype materials to seek immediate feedback on software not yet marketed.

Evaluation of the Colloquium indicated that over eighty percent of the participants judged it to be an excellent component of a software evaluation process. Among the recommendations for future action most desired by participants were for purchase of State distribution rights for other software evaluation reports; State identification, review and distribution of teacher-developed or other New York State public domain software; and negotiation and purchase of State rights for the distribution of commercial software.

The Software Colloquium is viewed by the Center for Learning Technologies as holding significant potential for a mutually beneficial producer/consumer (public/private) relationship that yields high quality software in response to local educator and student needs. The Colloquium will sponsor a series of roundtable discussions aimed at improving the content and quality of software used in New York State schools.

The Software Colloquium and other initiatives of the Center for Learning Technologies were described in an article in the September, 1983 issue of **Electronic Learning**. The article is reproduced on the following pages.

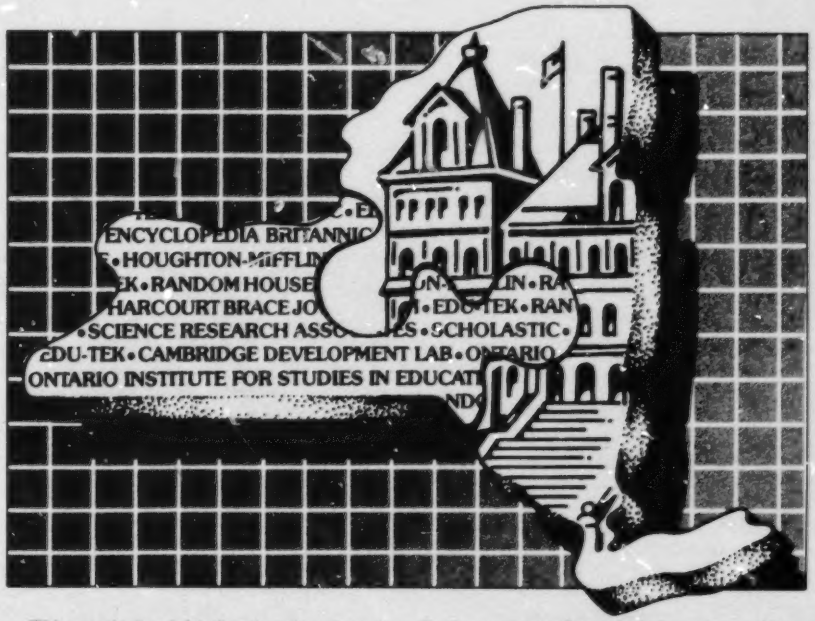
NEW YORK: CREATING GOOD SOFTWARE THROUGH COOPERATION

In New York, educators and software publishers are working together.

BY LORRAINE HOPPING

"The benefits of computers . . . hinge upon the dedication, persistence and ability of educators as well as courseware developers to use technologies as effective tools . . . As educators, we have an obligation and a pressing responsibility to take the forefront in assuring that technological advances enhance the learning environment for our children."

—Gordon Ambach
New York Commissioner of Education



COMMISSIONER AMBACH has been as good as his word. Within weeks of his comments before the New York State Assembly Education Committee last March, staff members of a newly formed Center for Learning Technologies (CLT) began work on a large number of instructional computing initiatives, all aimed at improving education in New York's more than 6000 elementary and secondary schools. (*See Overview Chart, page 38.*) Now, several months later, it's clear that if the implementation of these initiatives proceeds with the same thoroughness and sense of purpose that marked the planning stages, New York educators will indeed be "taking the forefront" in their use of computers for education.

The experiences of other state governments in promoting effective use of computers have obviously not been lost on the staffers in charge of the New York CLT; they are focusing largely on in-service concerns and on the coordination of local computing activities around the state. One goal they are actively pursuing, however, has not been considered the domain of other quite active state DOEs: actually working together with educators and publishers in a partnership aimed at improving educational software.

Lorraine Hopping is an assistant editor on the staff of Scholastic's Teaching and Computers *Magazine and a frequent contributor to* Electronic Learning.

This particular initiative has its roots in the background of the New York CLT's director, Gregory Benson. He has, as he puts it, "seen both sides of the fence." As an executive vice-president for the Bibliographic Retrieval Service, Benson felt that industry in general was not responding directly to educators' needs. After joining the State Education Department (SED), he became concerned that educators weren't keeping up with technology. The best way to combat the two problems, he concluded, was not to commit the SED to a major production effort in public domain software, but rather to try to find ways to help commercial publishers improve their offerings.

> BY ALL ACCOUNTS, THE FIRST SOFTWARE COLLOQUIUM APPEARS TO HAVE BEEN A GREAT SUCCESS.

As a consequence, Benson set about creating a forum for representatives from both groups to discuss their common interests. Within weeks after Commissioner Ambach's speech, the Software Colloquium Planning Committee, staffed by representatives from major software publishers, the SED, BOCES (regional education authorities), and school districts, was launched.

GETTING STARTED

The Committee's main goal was to initiate, through a series of Software Colloquiums, on-going dialogs between educators and publishers on specific educational needs, based on educator reviews of commercial software and on a statewide survey of computer usage in New York schools. It got started by hammering out a list of important criteria for good software, and publishing it in a Courseware Description Grid for distribution to courseware reviewers through the CLT and through Technical Assistance Centers (TACs)—regional branches under CLT authority.

The next step was to request copies of commercial software for the state reviewers to see. Response from the publishers, Benson says, was immediate and overwhelming. Eager for feedback, companies flooded the

(Continued on page 39)

STATES TO WATCH

OVERVIEW OF NEW YORK STATE OBJECTIVES AND INITIATIVES

Editor's Note: The Center for Learning Technology (CLT) directs statewide educational computing activities and oversees six regional Technical Assistance Centers (TACs). This chart outlines the major CLT initiatives on the left and four broad objectives across the top. These objectives include: Insuring the quality of computer products used in schools; providing effective in-service training; using research to ensure a positive influence of technology in education; and coordinating local efforts for an equal distribution of computer technology and technical know-how.

CLT INITIATIVES	OBJECTIVE: QUALITY COMPUTER PRODUCTS	OBJECTIVE: EFFECTIVE IN-SERVICE TRAINING	OBJECTIVE: USE OF RESEARCH	OBJECTIVE: COORDINATE LOCAL ACTIVITIES
Software Colloquium	Involves educators in establishing criteria for quality software and reviewing 'model' courseware	Helps educators become knowledgeable consumers of computer products	Correlates computer use in schools and educator concerns about quality software; correlates hardware needs and available technologies	Establishes state evaluation criteria; disseminates software reviews and prototypes through TACs; coordinates hardware purchases to insure compatibility of computer systems
Hardware Acquisition; Vendor Rapport	Maintains hardware inventory and prioritizes needs; draft a Hardware Implementation Plan; coordinates donation of equipment by hardware manufacturers for testing, demonstration and development	Helps arrange for hardware donations for in-service workshops	Correlates hardware needs and available technologies	Coordinates hardware purchases between regions and local districts to insure compatibility of computer systems and equal distribution of equipment; hardware donations for in-service assure equal quality training at local level; general donations assure equal distribution
CLT Newsletter; Publications	*Courseware Reviews:* Publishes guide books, for courseware in the curriculum areas (first one is on language arts)	Publishes *Getting Started:* 10-page guide for implementing computers; booklet on interactive technologies; 34-page listing of 1983 in-service courses on educational computing	Newsletter reports on survey results and disseminates current information on computer literacy	Videotape describes purpose and activities of TACs (national dissemination); 'Micro Publications' serves as a reference directory of CLT directors and personnel and of CLT events (teleconferences, special events, etc.)
TV, Radio Productions; Videotapes	SED controls public TV and radio programming; educational programs address bilingual education, refugees, black history, economics, etc.	Six CLT tapes include *The Learning Technology Special* and *Computing: Strategies for Success;* Project BEST tapes teach computer literacy (news, implementation, product evaluation, applications); CLT distributes tapes of National Diffusion Network Conferences		Videotapes provide easily accessible information for educators throughout the state; TV and radio serve as a state and national media for the dissemination of computer literacy instruction and educational programming
Statewide Instructional Computing Network Survey of Educational Computer Use; 1983 Survey of Computer Use in New York Schools	SICN survey "defines hardware and software resources, indicates software and instructional design needs, and assists in negotiating with vendors"	Identifies in-service needs on a district-by-district basis	Surveys help administrators project future computer use; teachers may compare computer use in other districts by subject, grade level, and student/computer ratios	Survey results disseminated through newsletter; provides information on technology uses by region and by state for evaluation of strongest needs
Computer Literacy Guidelines and Materials	Statewide guidelines feature computer awareness in early grades; integration of interactive technologies, and robotics curriculum at secondary level	Publications help define computer literacy and basic competencies for teachers and students; guidelines identify subject areas where use of technology may be appropriate	All guidelines and materials have been based in part on research of computer usage nationally and across the states.	Provides a comprehensive standard by which local districts can coordinate literacy programs
In-Service Training Workshops, Sessions, Demonstrations, Computer Labs	Educators on local, regional and state levels become proficient reviewers and participate in software review procedures prior to software colloquiums	Regular workshops and presentations promote the use of technology in education; 12-hour courses train more than 160 SED employees; computer labs offer advanced training of SED and BOCES employees; Summer Institute of Technology conference brings together all state commissioners of education		Educators trained according to established statewide requirements; TACs provide consistent and equitable in-service programs throughout the state

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Hardware/Software Evaluation	Provides equipment and training for educators to preview and review software and hardware	Trains educators to evaluate hardware/software based on state guidelines and criteria	Conducts research into hardware and software criteria, advancements, etc. used as guidelines for evaluation procedures	TACs act as software/hardware evaluation sites, providing every educator the opportunity to review computer products and exchange opinions
Department of Defense Military Technology Transfer Program	Transfers DOD technologies from military to civilian sector (including videodiscs, handheld programmable devices, and more)			Use of DOD facilities allows all educators to attend demonstrations of DOD technologies
New York State Network (comprehensive design expected this month)		Intended to provide educators with information faster, cheaper, and more easily via computer		Educators will share information, including curriculum guides, via computers; data bases will be accessible by all educators through TACs
Computerization of Cultural Education Institutions (museums, libraries, etc.)	Introduces technology (data bases, etc.) into cultural institutions			Cultural institutions that fall under SED direction are an integral part of instruction in schools; act as centers for educators and students from different districts to meet, exchange ideas
Learning Technologies Fair, Regional and State Conferences, and CLT Special events		Fair provides educators with an opportunity to become familiar with educational applications of technology and explore specific technologies in a school setting; conferences include hands-on seminar		Conferences provide opportunities for educators to pool resources and information

(Continued from page 36)

CLT with three copies each of 800 programs and prototypes for programs—700 more than reviewers could handle in the one month allotted for reviewing!

The committee selected 100 programs equally divided between four major subject areas—math, computer literacy, science, and language arts—and between grade levels. The members decided to send two copies of each program to local reviewers for classroom testing and one copy to staff specialists at the SED to measure program content against state guidelines.

In anticipation of the July Software Colloquium, during which educators and publishers would discuss the reviews, the CLT videotaped teachers and students using some of the programs in a classroom setting. The most revealing and informative of these narrated tapes were then selected for continuous showing at the Colloquium.

THE COLLOQUIUM

By all accounts, the first colloquium appears to have been a great success. The planning committee had organized the colloquium into four sections based on curriculum areas, with each section composed of representatives from several publishers and, of course, from education offices. The list of companies that agreed to send representatives reads like a regular *Who's Who of Educational Computing*; among others. it included Houghton-Mifflin, Random House, Encyclopedia Britannica, the Ontario Institute for Studies in Education, Science Research Associates, Edu-Tek, Cambridge Development Lab, Scholastic Inc., and Harcourt Brace Jovanovich.

> THE LIST OF COMPANIES THAT AGREED TO SEND REPRESENTATIVES READS LIKE A REGULAR *WHO'S WHO OF EDUCATIONAL COMPUTING.*

The committee spent most of its time examining the programs that had been reviewed, but also set aside a period for all educators and publishers to discuss software-related issues, including the illegal duplicating of copyrighted software, negative reinforcement in CAI (Computer-Assisted Instruction), and the importance of documentation. This dialog, according to Benson, turned out to be the high point of the colloquium. Of particular interest, he says, was the viewing of the videotapes showing students using the publishers' programs. In one case, after a child was shown throwing up his hands in frustration at a particular program, the educators and publishers launched into in-depth discussion about the software and the limitations it imposed on the sorts of answers that it would accept. As a result of the discussion, Benson says, publishers left the Colloquium with a new sensitivity to the ways students use their programs in the classroom. Some of the features of educational software pointed out by educators as particularly worthy of the publishers' attention included:

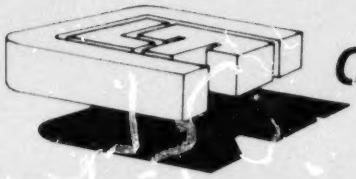
- **Paging**—the ability to "page" through introductory information (as quickly or as slowly as the user desires)
- **Escape features**—by which a confused computer-user can get out of a program and begin it all over again; and
- **Error-trapping capability**—by which a program would not reject out of hand an answer of "Yse" instead of "Yes"

In general, Benson sums up, the consensus of the meeting seemed to follow along the lines of one educator's comments—that software should be capable of "responding just as the teacher might," at least as far as the technology allows.

The Software Colloquium Planning Committee is presently preparing for the next joint educator/publisher meeting. "For this one," says Benson, "we may break into smaller colloquiums to give more people a chance to participate. We will probably also concentrate more on specific software functions, like the error-trapping, rather than subject areas. And at some point," he adds, "we may even try to do one on TV for airing around the country."

EL

BEST COPY AVAILABLE



CENTER FOR LEARNING TECHNOLOGIES

NEW YORK STATE EDUCATION DEPARTMENT, ALBANY N.Y. 12230

SOFTWARE EVALUATION FORM

PART 1

PROGRAM OVERVIEW AND DESCRIPTION

1. Title: _____

_____

2. Subject area and specific topic: _____

_____

_____

3. Prerequisite skills necessary: _____

_____

_____

_____

INSTRUCTIONS

USE NO. 2 PENCIL ONLY

- Do NOT use ink or ball-point pens.
- Make dark marks that fill the circle completely. ●
- Erase cleanly any mark you wish to change.
- Make no stray marks on this form.

4. Appropriate grade level (mark correct grade)

1	2	3	4	5	6	7	8	9	10	11	12	COLLEGE
○	○	○	○	○	○	○	○	○	○	○	○	○

5. Type of program (mark one or more)

- ○ Drill and Practice
- ○ Tutorial
- ○ Problem Solving
- ○ Simulation
- ○ Educational Game
- ○ Authoring System
- ○ Testing
- ○ Classroom Management
- ○ Remediation
- ○ Enrichment
- ○ Other (specify) _____

6. Appropriate group instructional size:

- ○ Individual
- ○ Small group
- ○ Class

7. Is this program an appropriate instructional use of the computer?

- ○ Yes
- ○ No

COMMENTS: _____

_____

_____

_____

_____

_____

DO NOT MARK IN THIS AREA

TO BE COMPLETED FROM PUBLISHER'S INFORMATION

Program Title: _____

○ 5¼" disk ○ cartridge
○ 8" disk ○ tape

Package Title: _____

Microcomputer (brand, model, memory): _____

Necessary Hardware: _____

Necessary Software: _____

Producer: _____

Author(s): _____

COST

0	0	0	0	0
1	1	1	1	1
2	2	2	2	2
3	3	3	3	3
4	4	4	4	4
5	5	5	5	5
6	6	6	6	6
7	7	7	7	7
8	8	8	8	8
9	9	9	9	9

COPYRIGHT DATE (If any)

	DAY		YEAR			
JAN ○						
FEB ○						
MAR ○	0	0	0	0		
APR ○	1	1	1	1		
MAY ○	2	2	2	2		
JUN ○	3	3	3	3		
JUL ○			4	4	4	
AUG ○			5	5	5	
SEP ○			6	6	6	
OCT ○			7	7	7	
NOV ○			8	8	8	
DEC ○			9	9	9	

Back-up Copy Policy:
○ Yes
○ No

MAKE NO STRAY MARKS ON THIS FORM

TO BE COMPLETED BY PUBLISHER FOLLOWING FIELD EVALUATION
Please verify the instructional strategies as designed by your author

Type of program (mark one or more)
○ Drill and practice
○ Tutorial
○ Problem Solving
○ Simulation
○ Educational Games
○ Authoring System
○ Testing
○ Classroom Management
○ Remediation
○ Enrichment
○ Other (specify)

NOTE: This form is a modification of an Electronic Learning magazine software evaluation form published in October, 1982 and revised by the New York State Education Department's Software Colloquium Planning Committee in March, 1983.

DO NOT MARK IN THIS AREA

PART 2

EVALUATION CHECKLIST

► EDUCATIONAL CONTENT ◄

STRONGLY AGREE	AGREE	DISAGREE	STRONGLY DISAGREE
○	○	○	○
○	○	○	○
○	○	○	○
○	○	○	○

1. The program content is accurate
2. **The program content is appropriate for intended users**
3. The difficulty level is consistent for subject, grade, reading level and vocabulary
   ○ Too easy ○ Too difficult
4. **The program content is free of bias and stereotypes**

Comments: _____

► PRESENTATION ◄

STRONGLY AGREE	AGREE	DISAGREE	STRONGLY DISAGREE
○	○	○	○
○	○	○	○
○	○	○	○
○	○	○	○
○	○	○	○
○	○	○	○

1. The program is free of technical problems
2. **The instructions are clear**
3. The curriculum material is logically presented and well organized
4. **Graphics, sound, and color enhance the instructional presentation**
5. Additional graphics, sound, or color are needed
6. **The screen display is clear and easy to read**

Comments: _____

► INTERACTION ◄

STRONGLY AGREE	AGREE	DISAGREE	STRONGLY DISAGREE
○	○	○	○
○	○	○	○
○	○	○	○
○	○	○	○

1. Cues and prompts help students to answer questions correctly
2. **Students can access the program "menu" to obtain help or to change activities**
3. Students can control the pace and sequence of the program
4. **There are safeguards against students destroying the program by erroneous inputs**

Comments: _____

► MOTIVATION ◄

STRONGLY AGREE	AGREE	DISAGREE	STRONGLY DISAGREE
○	○	○	○
○	○	○	○
○	○	○	○

1. The feedback is effective and appropriate
2. **The program incorporates ACTIVE student involvement**
3. The program holds the interest of students

Comments: _____

► TEACHER USE ◄

STRONGLY AGREE	AGREE	DISAGREE	STRONGLY DISAGREE
○	○	○	○
○	○	○	○
○	○	○	○
○	○	○	○
○	○	○	○
○	○	○	○
○	○	○	○

1. Record-keeping is possible (within the program or through documentation worksheets)
2. **Teacher has to monitor student use**
3. Program requires minimum teacher monitoring
4. **Teacher can modify the program**
5. The documentation is clear and comprehensive
6. **The objectives are stated in the documentation**
7. The objectives are achieved by the program

Comments: _____

MAKE NO STRAY MARKS ON THIS FORM

PART 3

OVERALL EVALUATION

MARK ONLY ONE CHOICE

- ○ Excellent program. Recommend without hesitation.
- ○ Pretty good program. Consider purchase.
- ○ Fair. But might want to wait for something better.
- ○ Not useful. Do not recommend purchase.

Describe any major strengths or weaknesses: _____

TO BE COMPLETED BY REVIEWER

Reviewer's primary teaching area and position: _____

REVIEWER'S LAST NAME, FIRST INITIAL

NUMBER AND STREET

CITY

STATE

AREA CODE) **TELEPHONE NUMBER**

ZIP CODE

DATE OF REVIEW

	DAY	YEAR
JAN ○		
FEB ○		
MAR ○	0 0	0 0
APR ○	1 1	1 1
MAY ○	2 2	2 2
JUN ○	3 3	3 3
JUL ○	4 4	4 4
AUG ○	5 5	5 5
SEP ○	6 6	6 6
OCT ○	7 7	7 7
NOV ○	8 8	8 8
DEC ○	9 9	9 9

K ○ 1 ○ 2 ○ 3 ○ 4 ○ 5 ○ 6 ○ 7 ○ 8 ○ 9 ○ 10 ○ 11 ○ 12 ○

GRADE LEVEL TAUGHT BY REVIEWER

Excerpts from *Electrnic Learning Magazine*, by Scholastic, Inc., reprinted by permission of Scholastic, Inc.

THE NEW YORK STATE NETWORK FOR EDUCATIONAL TELECOMMUNICATIONS (NYSNET)

Anticipating future needs and the rapidly expanding potential of computer-based telecommunications technology, the CLT is conducting a study of the feasibility of developing a statewide computer-based telecommunications network for resource exchange. A State Education Department team, chaired by a CLT staff member, developed a set of specifications for the system (called NYSNET), met with commercial vendors, and identified the range of existing and potential services available. These include electronic mail, bulletin boards, searching of databases and bibliographic/document files, and software uploading and downloading.

A model for the development and operation of NYSNET over a multi-year period is underway at CLT. Subsequent planning and development activities include: detailed needs analyses, demonstrations of potential services, cost analyses, and pilot projects. A comprehensive system design and operational plan will be completed late in 1984, with implementation (contingent on available resources) planned for early in 1985.

OTHER CLT RESOURCES

Media Distribution Network

CLT's Media Distribution Network is responsible for the duplication and dissemination of all computer, video, and audio programs developed by the New York State Education Department, as well as other public agencies throughout the country. Some of the resources distributed by the Network include: a series of five tapes made available by Project BEST, a national project funded by the US Department of Education that deals with computer technology programs at local, state and national levels; descriptions of local school district planning efforts; computer literacy issues; hardware and software evaluations; and administrative and instructional applications of computers.

A second series of sixteen tapes dealing with technology and applications in schools has been made available by the National Diffusion Network. This series includes presentations by noted national experts in computer education on a wide range of topics. Those addressed to educational software include:

- The Computer as a Tutor: Products Currently on the Market to Teach Basic Skills
- Using Computer Simulations in Social Science, Science and Math
- Using the Computer to Develop Writing Abilities
- Software Development: Key Issues and Considerations

The CLT Network also distributes to educators in the field software evaluations produced by the MicroSIFT Project of the Northwest Regional Educational Laboratory. Over 150 evaluations are available, with updates provided quarterly. CLT also is negotiating with three other software evaluation producers for bulk rate discounts and statewide distribution. These evaluation packages include EPIE, Consumers Union, Courseware Report Card, and the Digest of Software Reviews in Education.

Computer Training Laboratories

The Center for Learning Technologies has established computer training laboratories, which are located within the Cultural Education Center at the Concourse Level, Empire State Mall. The laboratories provide a diverse range of training courses such as computer literacy, computer-assisted instruction, computer-managed instruction, school administrator applications, authoring systems and programming languages, statistical and other analytical uses of the computer, and communications applications. Training is provided on a wide range of micro-, mini-, and supermini computer systems produced and donated by Apple, Victor Technology, Honeywell, Prime, Commodore, Control Data Corporation, and others. Training is provided to several different constituencies, such as state education agency staff, educators in the field, other State agencies, the business community, and the community at large.

Specific training topics include:

- Computer Literacy
- Repair and Maintenance
- Computer-Assisted Instruction (CAI)
- Computer Managed Instruction (CMI)
- School Administrator Applications
- Computer Business Applications
- Introduction to Program Development
- BASIC I, II and III
- PASCAL I, II and III
- Text Editor Course
- PILOT
- LOGO
- Other Authoring Systems
- Statistical Programs I and II
- Communications/Access to Mainframe Databases (Networking)
- Executive Staff – Management Information Systems and Decision Support

Additional information on materials and training may be obtained by contacting:

CLT Media Distribution Network & Computer Training Labs
Cultural Education Center, C-7 Concourse Level
New York State Education Department
Albany, New York 12230

GLOSSARY

ACOUSTIC COUPLER
A device attached to a computer terminal to transmit and receive audio tones via telephone lines. A type of modem.

A/D INTERFACE
A/D (Analog/Digital) A circuit that changes an input voltage fluctuation (continuous), such as results from a musical tone, into digital information for processing by the computer. Also converts digital information to analog.

ADDRESS
Designates where information is stored within a memory device.

ALGORITHM
An orderly step-by-step procedure, like a recipe, that consists of a list of instructions for accomplishing a desired result, or for solving a problem. Usually expressed in mathematical terms. In computer programming, an algorithm is expressed as a flowchart.

ALPHANUMERIC
The computer symbols, letters (A-Z) and/or numerals (0-99), and/or special punctuation, mathematical or graphic symbols.

ARCHITECTURE
The internal, preset arrangement or organization of a computer that determines how the computer operates.

ASCII
American Standard Code for Information Interchange. A binary number code for letters, numbers, symbols, etc., accepted as a standard by the industry.

ASSEMBLER
The program that converts English into machine language (binary format).

ASSEMBLY LANGUAGE
A computer language that uses mnemonic names to stand for one or more machine language instructions. Assembly language is similar to "shorthand," used to avoid the tedious use of long strings of zeros and ones found in machine language. The advantage of using assembly language instead of high-level language, such as BASIC, is speed of execution, but a high-level language is usually easier for a human being to understand.

AUXILIARY MEMORY (STORAGE)

Storage available in a computer system, in addition to its own memory banks; it can be either disk or tape.

BASIC

An acronym for "beginners' all purpose symbolic instruction code". A high level conversational interpretative programming language in wide use. Always written in capital letters, BASIC permits the use of simple English words and common mathematical symbols to perform the necessary arithmetic and logical operations needed in programming microcomputers.

BASIC-IN-ROM

This term indicates that the programming language BASIC has been stored in Read Only Memory (ROM).

BATCH PROCESSING

A method of processing information in logical groups.

BAUD

Rate with which a device transfers information in one second. 1200 Baud is equivalent to about 120 characters per second. It is stated in bits per second (bps).

BELT PRINTER

A printer which uses a steel belt with character impressions; the belt rotates at high speed. When a desired character is in the correct position, it is struck from behind with a stationary "hammer," thus imprinting the character on the paper. The belt printer forms a solid character.

BINARY CODE

A code that uses zeros and ones for data. 10110011 may represent the letter C.

BINARY SYSTEM

A number system based on the number 2, just as the decimal system is based on the number 10. The binary system is represented by the digits 0 and 1, and each place in a number represents a power of 2.

BIT

Binary Digit. The smallest unit of digital information thought of as representing: a yes/no choice of whether a circuit is on or off, stated as a one or zero.

BOOLEAN

A form of logic, named after 19th century English mathematician George Boole, which allows a computer to make decisions about program branching. Examples of Boolean logic commands are IF . . . THEN, AND, OR, NOT, etc.

BRANCH

An instruction which, when met in a program, causes a move to another part of the program, deviating from the normal sequencing of the program. Branch statements are one of two types: conditional statement command (IF . . . THEN); or unconditional statement comment (GO TO).

BRANCHING PROGRAMS

An instructional program designed in such a way that the student's progress through the program is determined by the specific answers given. If remedial work is required, the microcomputer will take the student into a remedial branch and provide the work necessary before continuing through the main portion of the program. The path a student uses is determined by that student's response.

BOOTSTRAP

A short sequence of instructions which, when executed by the computer, will automatically allow another longer program to be loaded from an input peripheral to the programmable memory of the Central Processing Unit (CPU).

BPS

Bits per second.

BUFFER

A space in a computer system where information is temporarily stored. Usually used to store small

sections of data during a transfer process. For example, data may be read from a tape cassette in small units, placed in a buffer, then transferred to main memory when the computer is ready to process the data.

BUFFERED I/O

Input/Output operations using a buffer to increase speed. Because of the slowness of I/O devices, information is held in the buffer until enough has accumulated to make it worthwhile for the extremely fast Central Processing Unit (CPU) to act.

BUG

Error: may be either a programming error or equipment malfunction.

BUS

Set of wires that allows data to be sent bidirectionally within microcomputers.

BYTE

A group of binary bits. Eight bits is commonly equal to one byte. It takes 8 bits to form one character; so one byte is generally equal to one letter, number, or graphic symbol.

CAI

Please see: Computer-Assisted Instruction.

CASSETTE RECORDER

A device by which information is stored. The information is put onto the cassette as audio signals. The cassette information is stored sequentially and is therefore a slower format for storage of information.

CBI

Please see: Computer-Based Instruction.

CHARACTER

Single items that can be arranged in groups to stand for information. There are two forms: (1) numbers, letters, graphic symbols, etc., that can be understood by human beings, and (2) groups of binary digits that can be understood by the computer. A character is usually represented by one byte.

CHARACTER CHECKING

A computer procedure for examining each individual character or group of characters to check for accuracy and consistency.

CHARACTER SET

Refers to the characters available to a computer, printer, or terminal. Some devices have only upper case letters plus numbers and a few special characters such as punctuation, #, 1, etc. Others have upper and lower case letters, numbers, and many special characters which may be combined to form designs.

CHARGE COUPLED DEVICE (CCD)

A form of memory, not yet extensively in use, that stores digital information in a very small space. A CCD is volatile memory. CCD's may eventually have a storage capacity of several megabytes each, and will provide faster access time than other forms of storage.

CHIP

The heart of a microcomputer, on which thousands of electronic elements are implanted. The chip, made of silicon, is an integrated circuit; it contains all the circuitry to carry out the many computer operations. It is created through a photographic etching process.

CLASSROOM MANAGEMENT SYSTEMS

A program that maintains the class records for a teacher. It may include grades, test scores, attendance, as well as other student information.

CLOCK

A device, inside the computer, that times events and keeps them coordinated. It also controls the rate at which information is processed, a rate sometimes measures in nanoseconds or in jiffys (1/60 of a second).

CMI

Please see: Computer Managed Instruction.

CODE

The relationship between bits and a set of characters, alphabet letters, numbers or graphic symbols. Each character has its own bit code (a combination of zeros and ones). The most commonly used code is the American Standard Code for Information Interchange (ASCII).

CODING

Developing a set of computer instructions.

COMMAND

An instruction given to the computer from an input device.

COMPATIBILITY

There are two types of compatibility: software and hardware. Software compatibility refers to the ability to run programs on a variety of computers. Hardware compatibility means that various components (printers, disks, keyboards, etc.) may be connected directly.

COMPILER

A program inside the computer that translates commands written in a high-level language into machine language.

COMPILER LANGUAGE

A computer language more easily understood by a human being than an assembly language. Compiler language instructs a compiler to translate a source language into a machine language.

COMPUTER-ASSISTED INSTRUCTION (CAI)

Direct instruction conducted by the computer. Examples of this type of instruction are: drill and practice, tutorial, simulation and gaming, inquiry and dialogue, information retrieval, and problem-solving.

COMPUTER-BASED INSTRUCTION (CBI)

The overall term used to describe the use of computers in the instructional process. Usually divided into two areas: computer assisted instruction and computer managed instruction.

COMPUTER LANGUAGE

A language used to communicate with a computer. All computer language instructions must be translated by a program within the computer into the machine's internal language in order for the instructions to be implemented.

COMPUTER LITERACY

An understanding of computers and their applications in the everyday world. To be computer literate, a person should have a cursory understanding of computer programming, problem-solving, applications of computers in various fields, the impact of computers on society, computer system components, and the computer capabilities and limitations.

COMPUTER-MANAGED INSTRUCTION (CMI)

Instructional support functions conducted by the computer. Examples of the support functions are: testing, prescribing, record keeping, schedule monitoring, and time and resource management.

CONTROL UNIT

Portion of a computer which directs the operation of the computer, interprets instructions, and initiates the proper signals to the other computer circuits to execute instructions.

CORRELATION

The matching of the content of instructional software with textbooks, reference materials and/or instructional media.

COURSEWARE

Instructional materials for the computer, including the program itself (in disk or tape form), and the teacher and student print materials needed for appropriate use.

CPU

The Central Processing Unit controls what the computer does. The arithmetic, control and logic units do computations and direct functions for the computer.

CROSS-ASSEMBLER

Program run on the computer to "translate" instructions into a form suitable for running on another computer.

CRT

The Cathode Ray Tube is similar to a television screen. The CRT usually is accompanied by a keyboard from which information is entered into the computer.

CURSOR

Usually a blinking indicator on the CRT that shows the user where the next character to be typed will appear.

DAISY WHEEL PRINTER

A printer that has a wheel mechanism, with characters on the perimeter of the wheel. The wheel rotates to place the appropriate character in print position. A "hammer" strikes the character, forcing it against a ribbon, thereby forming an impression on the paper. The daisy wheel printer forms a solid character on the paper; it has the reputation of great reliability and is relatively inexpensive.

DATA

The information given to or received from a computer.

DATABASE

Any uniform collection of data; usually refers to a collection that is stored in a computer for easy and quick retrieval.

DEBUG

Process of finding, locating, and correcting errors in a program.

DIAGNOSTIC ROUTINE/PROGRAM

A program that will check out the hardware and peripherals for incorrect information and breakdown.

DIGIT

A zero or one in the binary system.

DIRECT MEMORY ACCESS (DMA)

A technique to move data rapidly from the microprocessor to a storage device (i.e., disk).

DISK (DISC) – DISKETTE

Magnetic coated material in a 5" or 8" record-like shape on which information and programs are stored. The information is stored randomly and therefore faster than on cassette storage. Sometimes called diskettes or floppy disks.

DISK DRIVE

A mechanical unit that may be built into the microcomputer case or may be an add-on peripheral which reads and records on a round magnetic surface. See also "disk" and floppy disk."

DOCUMENTATION

A written description of a piece of software or hardware. It gives the directions to operate a program or piece of equipment.

DOS

Disk Operating System. A set of programs and instructions that permit interaction between the diskettes and the microcomputer.

DOT MATRIX

A method to generate graphic characters by using dot patterns. A 5 x 7 dot matrix is a common example.

DRIVER
A program that controls the peripheral devices and their interaction with the Central Processing Unit (CPU).

DUMB TERMINAL
A terminal that acts as an input/output device only.

DUMP
To load what is in memory (or part of it) in the CPU or into another storage medium.

DUPLEX
Process of establishing two-way communication simultaneously between computers or terminals.

DYNAMIC MEMORY
A type of programmable memory which requires that the information on tiny capacitors inside integrated circuits be refreshed every so often to prevent the data from being lost. Generally uses less power and is cheaper and faster than static memory.

EDITOR
A program that allows a person to change or modify another program.

EPROM
Erasable Programmable ROM. A read-only memory which can be erased either by an electrical signal or by ultraviolet light.

ERROR
The difference between the actual response of a program and the desired response.

ERROR TRANSMISSION
Change in information caused during data transmission.

EXECUTE
The running of a computer program.

EXECUTIVE CONTROL PROGRAM
Main system program designed to establish priorities and to process and control other programs; also called a monitor.

EXTERNAL STORAGE
Peripheral device for storage (i.e., tape or disk).

FAIL SOFT
System for protecting data against loss in the event of system failure.

FILE
Collection of related data.

FILENAME
Number or letter characters to identify a file or collection of data.

FIRMWARE
Programs that are permanently stored in programmable read only memory (PROM) Memory to allow easier understanding of the computer's operation. The programs are loaded in read only memory (ROM or PROM). Firmware is often a fundamental part of the system's hardware design, as contrasted to software, which is not fundamental to the hardware operation.

FLOPPY DISK (DISC) DRIVE
A device for storing masses of information on a rotating, flexible, metallic-coated plastic disk which is similar to a 45 rpm record. Information can be stored and retrieved.

FLOWCHARTING
A programming technique using shaped blocks to indicate the direction and sequence of operations in a program.

FORTRAN
Science-oriented program language. The acronym stands for Formula Translator.

FREQUENCY
Rate at which anything occurs and recurs, measured in cycles or hertz per second.

FULL DUPLEX
Reception and transmission of information at the same time.

GIGO
Garbage In, Garbage Out. If incorrect information is put into the computer, the output will be misinformation.

GRAPHICS
Characters that can be used to form figures, shapes, and forms on the screen or printer. In addition to letters and numbers, a computer may have a graphics character set that can be used to create graphics by writing them into a traditional computer program, by using a graphics tablet, or by using a light pen on the CRT surface; depending upon the capability of the particular microcomputer.

GRAPHICS TABLET
A flat device which, when drawn upon, will transmit the drawing to the output device, to a microcomputer's memory, and/or to its storage device.

HALF DUPLEX
System of communication in which either transmission or reception can occur at a given time, but not both simultaneously.

HANDSHAKING OPERATION
Interaction of the central processor and interfaced devices which requires the device to signal the processor as each command occurs during data transfer. This operation is performed by modems or terminals to verify that channels are cleared and that operations can proceed.

HARDCOPY
Data or information printed on paper as distinguished from the temporary image on the computer's screen.

HARDWARE
The physical equipment that goes into a computer system, consisting of the central processing unit plus all peripherals.

HARDWIRED
Physically interconnected and usually intended for a specific purpose. Hardwired logic is essentially unalterable; a microprocessor, on the other hand, is programmable and may be adapted to accommodate various requirements.

HEAD
That part of a recorder that does the actual recording on the medium, or reads information from a pre-recorded medium.

HIGH-LEVEL LANGUAGE
A computer programming language using English words, decimal arithmetic, and common algebraic expressions. Each instruction represents a large number of computer operations.

HIGH RESOLUTION
The capability of producing and reading at least 256 lines or columns of dot pattern on a cathode ray tube (CRT). High resolution graphics produce an image that has the detail approximating a photograph.

INK JET PRINTER
In an ink jet printer, a high-speed stream of electrically charged ink droplets are fired through a magnetic field. The field deflects the droplets to direct them to the proper location on the paper. This type of printer is extremely fast but relatively expensive.

INPUT

Information going to and from a computer or peripheral. The same data may be output as well as input, depending upon the part of the computer to which it is going or coming.

INSTRUCTION

A group of bits, a command, that will make the computer perform a specific operation.

INSTRUCTION SET

List of commands to which a given computer responds. Instruction sets may vary among computers, even though those computers use the same programming language.

INTEGRATED CIRCUIT

A plastic or ceramic body with numerous leads extending from it. The body protects the silicon chip inside. The leads permit electrical connection of the chip to other components.

INTELLIGENT AUTHORING SYSTEMS (IAS)

A prepared program that guides an author through the process of developing an instructional program. It usually requires little or no computer skill to produce a program with one of these systems.

INTELLIGENT TERMINAL

Terminal with built-in programmable intelligence enabling it to pre-process information and/or instructions without the aid of a central processing unit (CPU).

INTERACTIVE

All personal computer systems are interactive, allowing for two-way communication while they are being used.

INTERFACE

An electronic circuit used to connect one electrical device to another electrical or mechanical device to allow the flow of data between units; the matching or interconnecting of systems or devices having different functions.

INTERNAL STORAGE

Memory system inside the computer, rather than disk or tape storage.

INTERPRETER

A program used to translate various computer languages.

I/O

Input and Output of data and information in a computer system, as through a keyboard, floppy disk drive, printer, cassettes, recorder, modem, graphics tablet, etc.

JOY STICKS

Small control devices that allow the computer operator to control actions or graphics on the screen. Most commonly associated with use in computer games.

KEYBOARD

Similar to a typewriter keyboard, this is where information is put into the computer, includes computer function keys, such as reset, run, clear, etc.

K/KILO

Equals 1000. With the microcomputer, it refers to the random access memory (RAM) or read only memory (ROM) memory capability, i.e., 16K is 16,000 bytes of information.

LANGUAGE

A format that allows a programmer to communicate more efficiently with a computer, where commands result in requested actions. BASIC is one of the most popular languages.

LEARNER VERIFICATION

Please see: Validation.

LIBRARY ROUTINES

A collection of standard routines that can be used in programs.

LINEAR PROGRAM

A program written in such a way that all students must proceed through each step of the program in the same sequence.

LINE FEED

The command to a teleprinter that advances the paper one line at a time.

LOAD

To put information into the computer's memory from mass storage, such as tape or a diskette.

LOADING TIME

The time, usually in seconds but sometimes minutes, that it takes to transfer the program from the disk or tape to the computer's internal memory. Loading from tape takes much longer than from disks.

LOW RESOLUTION

Video monitor or microcomputer capability that produces graphics as a series of square blocks. Usually there can be up to 64 blocks in each row.

MACHINE LANGUAGE

A computer programming language that has its instructions in binary, octal or hexadecimal format. Computers understand their own machine language without translation, but not all computers use the same machine language.

MACROINSTRUCTION

An instruction which causes the computer to execute one or more other instructions. These "other instructions" are called microinstructions. Please see: Instruction.

MAGNETIC BUBBLE MEMORY (MB)

A recent development in memory devices, not yet widely used, that stores digital information in the form of tiny magnetized areas ("bubbles") in a thin film of magnetic material. MB memories have the same potential for mass storage and fast access time as do charge coupled devices.

MAIN MEMORY

That memory which is directly accessible to the computer. In a microcomputer, main memory is referred to as random access memory (RAM) or read only memory (ROM).

MASS STORAGE

Devices such as disks or tapes are used to store large quantities of data. These devices are not directly accessible for processing by the computer; therefore, the data which are stored must be read into main memory before the computer can use it.

MATRIX PRINTER

The matrix printer is so-called because it forms characters from the matrix of dots. Usually the matrix consists of five dots across and seven dots down, or seven dots across and nine dots down. The 5 x 7 matrix is suitable for upper case letters and numbers; however, for lower case letters and other characters, the resolution provided by the 7 x 9 matrix is better.

MEDIUM OF TRANSFER

The physical form in which the software is provided, the most common being cassette tape, magnetic flexible disk and read only memory cartridge.

MEMORY

The integrated circuits of a computer which store information. In microcomputers, they are referred to as random access memory (RAM) and read only memory (ROM).

MEMORY CHIP

An integrated circuit on which data is stored as electrical charges.

MICROPROCESSOR

An integrated circuit that executes instructions inside the microcomputer. It is the "brain" of the computer.

MICROSECOND

One microsecond equals one millionth of a second. This is the speed at which some computers receive and execute instructions.

MODEM

A modulator-demodulator is an instrument used for communicating between computers using telephone lines.

MODES OF INSTRUCTION

The ways in which a student can interact with the software: e.g., drill and practice, tutorial, game, simulation and problem-solving.

MODULATOR

A device, sometimes called an RF modulator, which permits a standard television to act as a video display unit.

MONITOR

A video display unit which uses a cathode ray tube (CRT) to generate characters. It looks much like a normal television set and may be either black and white or color, as well as high or low resolution.

MOTHERBOARD

The central circuit board (or boards) inside the microcomputer which interconnects the various chips and forms the interface between memory and peripheral devices.

MULTI-PROGRAMMING

Refers to more than one microprocessor executing different programs simultaneously. A computer system may contain more than one microprocessor, thus multi-processing may occur within that system.

NANOSECOND

One nanosecond equals one thousandth of one millionth of one second. This is the speed at which many computers receive and execute instructions.

NOISE

Inaccurate data transmission.

NONVOLATILE MEMORY

Memory that holds data even after the power has been shut off. Read only memory (ROM) is sometimes nonvolatile. Disk and tape storage is nonvolatile. Nonvolatile ROM is also called static ROM or static memory.

OBJECT PROGRAM

The form of a program that can be understood by a computer. The object program results from the translation of a human readable program, called source program, into a machine language program. An object program appears as a series of numbers when printed or displayed.

OFF-LINE

Refers to data which are stored on devices not immediately accessible to the computer. Data stored on magnetic tape, punched cards, or paper tape must be loaded into on-line storage to be available to the computer.

ON-LINE

Refers to the location of data on storage devices which are immediately accessible to the computer. Usually on-line data are stored on disks, in random access memory (RAM), or in read only memory (ROM). Data which is off-line must be loaded into on-line storage for use.

OPERATING SYSTEM

The programming in the computer that links the chips and the circuits with the software package. Operating systems differ among the most popular microcomputers. Thus, software that runs on one brand of computer may not run, without modification, on another.

OUTPUT

Information coming from the microcomputer to a display unit such as a video display unit or a printer.

PARALLEL CONNECTION

An electronic connector that allows the microcomputer to communicate with peripheral devices (printers, keyboards, etc.) A parallel connection transmits data in parallel mode, that is, all bits of information are sent simultaneously. If the microcomputer is sending in parallel mode then the peripheral device must receive in parallel mode, and vice versa.

PARALLEL DATA TRANSMISSION

Microcomputers handle data in groups of eight or sometimes sixteen bits. These groups are called words. Parallel transmission refers to passing words from one component to another as an intact group. An eight-bit word would be transmitted as eight simultaneous bits along eight parallel wires.

PERIPHERAL DEVICE

A device, such as a printer, mass storage unit, or keyboard, which is an accessory to a microprocessor and which transfers information to and from the microprocessor.

PERSONAL COMPUTER

A microcomputer designed for instructional uses, entertainment, personal or business recordkeeping, etc.

PLOTTER

A special type of printer that draws two-dimensional shapes and designs on paper.

PORT

The location on the microcomputer where input and output devices can be connected. The most common type is an RS232 port.

PRINTER

A peripheral device that collects output data from the microcomputer and prints it on paper. Printers are defined as impact or non-impact. Impact printers strike the paper by a ribbon (like a typewriter). Non-impact printers form characters by electrical charges, or by spraying ink.

PROGRAM

A series of instructions to a computer which cause the computer to solve a problem or perform a task.

PROGRAMMED INSTRUCTION

A technique of organizing instruction into a series of very small segments which, by their design, lead the learner through the program with a minimum of incorrect responses.

PROM

An acronym for Programmable Read Only Memory. A type of permanent or static memory made of an integrated circuit which can be programmed after it has been manufactured. Programming a PROM consists of permanently recording data or instruction on the chips which make up the PROM.

RAM

Random Access Memory. Any memory which can be written on or read from, in which the memory locations can be accessed in random sequence. RAM can be erased and reprogrammed by the programmer as frequently as necessary. RAM size is expressed as a quantity of bytes such as 4K (4,000 bytes). RAM may be expanded by adding memory chips or memory boards.

READ

The act of retrieving information or instructions from memory or from an input/output device.

REFRESH

The process whereby volatile memory is constantly charged with electrical current. This keeps the bit pattern of the memory in proper order, thereby maintaining the data which are stored. Without refresh, the memory would lose electrical charge, consequently losing the stored data.

REGISTER

A temporary storage device located in the microprocessor which holds information the computer is currently using.

RESPONSE TIME

The time, usually in seconds, that it takes for the computer to respond to a command given by using the computer keyboard or other device, such as a game paddle.

REVERSE DISPLAY

Attribute of the display monitor which permits characters to be displayed either as white on black background or black on white background.

ROM

An acronym for Read Only Memory. It is an integrated circuit on which data or instructions are programmed at the time of manufacture. It cannot be erased or reprogrammed by normal computer operations. The size of ROM is expressed as the quantity of bytes, for example, 12K (12,000 bytes).

ROM CARTRIDGE

ROM stands for "read only memory" and indicates that the software program cannot be altered. ROM cartridges are used most often in game-oriented computers and are generally more limited in their capabilities.

ROUTINE

A series of instructions within a program which performs a specific subtask of the program. A routine is usually performed only once during the execution of a program.

RS232

The name of a type of port which permits serial transmission of data to a peripheral device. The RS232 Interface has been standardized by the Electronics Industry Association and is found on many microcomputers.

RUN

Jargon for "execute," to make a computer program operate.

SAVE

A command which causes information in the computer to be "written" into off-line or mass storage.

SCROLLING

A technique of displaying data on a cathode ray tube (CRT) screen. Each line of data appears first at the bottom and moves upward as new lines are displayed. Eventually the line disappears off the top of the screen.

SERIAL CONNECTION

An input/output port which allows serial transmission of data. In this serial transmission mode, each bit of information is sent individually. If a peripheral device receives in serial mode, then the microcomputer must send in serial mode, and vice versa.

SERIAL DATA TRANSMISSION

A means for transmitting computer words by sending bits individually in sequence. Whereas in parallel data transmission, the bits are carried along parallel wires, in serial transmission only one wire is used; therefore, bits are sent and received singly.

SMART TERMINAL

A terminal that has the ability to process data and function as a computer in addition to being an input/output device for a main frame computer.

SOFTWARE

The programs and accompanying documentation. Software is stored on tape cassettes, disks, and solid state cartridges. These are permanent methods of storage and are not erased when the computer is turned off. The computer reads the software into its temporary random access memory (RAM) in order to manipulate the data in its functioning. Please see also: courseware.

SOLID STATE CARTRIDGES

Storage devices that are composed of microprocessor chips which allow for playback but not recording. This produces the fastest type of loading.

SOURCE PROGRAM

A program written in a language such as BASIC, FORTRAN, or COBOL. The source program must be translated via a compiler, interpreter, or assembler into a machine language object program. The language of a source program is symbolic, that is, the instructions are represented by words or mnemonic devices which are readily understood by humans.

SPEECH SYNTHESIZER
A device which allows the computer to produce words and phrases as audible sounds.

STATIC MEMORY
A type of programmable memory which changes only when an electrical charge is applied. It does not require refresh operations as does dynamic memory.

STORAGE CAPACITY
The quantity of bytes a storage unit can hold. A diskette is said to store 48K (48,000 bytes), approximately 48,000 characters, letters, numbers, spaces, or symbols.

STORAGE DEVICE
A peripheral device that stores information, i.e., tape or disk.

STORE
To place information in a storage device.

SUBROUTINE
A portion of a program which performs a specific subtask. A subroutine is usually called upon several times during the execution of the program of which it is a member.

TAPE
The most common microcomputer tape is magnetic, such as cassette tape. Magnetic tape is stored in electrical charge patterns that are equivalent to what we know as letters, numbers, or symbols.

TERMINAL
A peripheral device that allows human communication with a computer.

TEXT EDITOR
A system of programs which facilitate editing. The functions available usually consist of adding text, deleting text, searching for specified text, paragraphing, and page layout.

TRACK
The area where magnetic impulses are stored on diskettes. Some diskettes have up to 70 or more tracks.

UART
Acronym for Universal Asynchronous Receiver Transmitter. This device converts parallel data transmission to serial data transmission, and vice versa.

VALIDATION
The testing of an instructional program on a representative sample of the intended users, then revising the program and/or content, when retesting. This procedure is repeated until the program is guaranteed to produce the results attributed to it without failure.

VERTICAL SCROLLING
A method of displaying text on a video display unit (VDU). In the case where more text is stored than can be displayed on a screen, the text is "scrolled," that is, moved up or down on the screen. When scrolled up, the text disappears off the top of the screen; when scrolled downward, the text rolls off the bottom.

VIDEO DISPLAY UNIT (VDU)
A part of a microcomputer similar to a television where information is placed on a screen.

VOLATILE MEMORY
A type of memory device that does not retain information when the electricity is turned off. Random access memory (RAM) is volatile.

WINDOW
Refers to partitioning a computer display into independent segments. A CRT screen may be divided into segments. For example, one segment may contain explanatory text; another pictures or other graphic symbols; another represent questions pertaining to the text and pictures; and a fourth segment could present responses to the student's answers to the questions. The contents of each segment or window may be varied independently of any other window.

WORD

A grouping of bits. Words may consist of eight bits or sixteen bits. Computers read, store, and manipulate data in words rather than as individual bits.

WORD LENGTH

The number of bits in a word. Most microcomputers have a word length of eight bits, though a sixteen-bit word length also is available from some manufacturers.

WRITE

The act of delivering information to a memory device or a storage medium.

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APPENDIX A

Publishers Who Attended the New York State Department of Education Conference, "Progress and Excellence: A Forum for Publishers and Educators as Partners in Education," December 14, 1982, Empire State Plaza, Albany, New York.

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